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Date 24th June 2002

Application No. 09/600,320

Dear Mr. Trieu,

In response to your letter to me dated 04/24/2002, I will attempt to answer your objections individually.

Page 2 refers to the "**"O" Ring 88**" which is now shown in Fig. 8 "B" which was incorrectly numbered before. "**Timing ring control mechanism 17I and 17T**" are now shown in Fig. 17 for the inlet "A" side timing ring and Fig. 21 for the inlet "B" side timing ring. Fig, 23 shows the "A" side transfer timing ring control mechanism and Fig. 25 shows the "B" side transfer timing ring control mechanism.

The claims have been retyped to remove the informalities objected to on pages 2, 3 and 4.

The objection on page 4 to the word "indirectly" seems to be grammatical rather than mechanical. From the thesaurus included in the Microsoft Word program, "Directly" is defined as an adverb meaning "in a straight line, straight or unswervingly". "Indirectly" is defined as an adverb meaning "not directly, in a roundabout way, circuitously, at one remove, ultimately or in some way". In Fig. 5 it can be seen that the crankshaft gear 22 does not mesh with, or even touch, the crankcase gear 23. The drive is, in fact, taken circuitously via the two "piggy back" idler gears 24A and 24B mounted between the crankshaft gear 22 and the crankcase gear 23 and not straight from one gear to the other. So, by definition, it would seem to be incorrect to describe the crankshaft gear 22 as directly driving the crankcase gear 23 because they do not touch each other. However, if you still prefer the gear train to be described as direct it is a simple matter to remove the prefix "in" from the word "indirectly" wherever required.

The objection to the words "and/or" has been retyped.

Page 5 rejects claims 1 and 2 because of the previous description cited in Patent No. WO 93/11343 wherein the gears were indeed indirectly connected but not by the idler gears being in "piggy back" fashion but being individual as shown in the Weber patent 5,221, 237. Previously,

although rotatable, neither the inlet nor the transfer timing rings had any provision for variable timing.

Page 6 again objects to the indirect gears but again, as previously explained, they were not "piggy back" gears before, as they are now. The Weber Patent 5,221,237 shows a gear train layout similar to, but not the same as, the Gahan system. The differences lie in the fact that the drive is taken through only one of the idler gears, namely 161. The other idler gear 129 does not mesh with either the gear 160 or the gear 126. this results in the larger gear 126 rotating in the opposite direction to the gear 160, whereas in the Gahan system, both the crankshaft gear and the crankcase gear rotate in the same direction. As is the case with most things in history, many things are obvious in hindsight. If this gear train layout is obvious, then why has no-one ever patented it before?

Page 7 objects to claims 6 and 7 because of the entry of fresh cold air, but the air flow is now synchronized with the amount of fuel delivered to the engine which it was not before. The amount of air entering the cylinder was independent of the fuel consumed; now it is controlled by the air flow butterfly valve.

Regarding claim 8, there was no previous provision for variable valve timing.

Page 8 refers to claim 11. Fig. 2 shows that the big-end 96 has no free space between itself and the crankcase 6B. Fig. 6 shows the crankcase 6A with the extended "tongues" to guide the con-rod big-end. If preferred, these guides can be numbered as 120.

Page three has been retyped to include the added drawings required to describe the variable timing ring control mechanisms. Pages 12, 13 and 14 describe the revised explanation. pages 18 and 19 include the retyped claims except for the alteration of the word "indirectly" to "directly". I have included another two sheets with this alteration if you really feel that the word "directly" is correct.

Due to the technicalities of this patent, I have appointed Mr. Michael Folise to act on my behalf in the future. I am sure that he will understand the processes involved much better than I do. His address is at the beginning of this letterhead.

None the less, I remain at your service for any future problems that may arise.

Yours faithfully,

J. P. Gahan

J.P. Gahan

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will be more readily understood with reference to the following description of an internal combustion engine incorporating the present invention, as illustrated in the accompanying drawings, wherein:-

Fig. 1 is a perspective, part section view of the rotary two-stroke engine.

Fig. 2 is a cross section view through the engine of Fig. 1.

Fig. 3 is a vertical section view through the engine of Fig. 1.

Fig. 4 is a horizontal section view through the engine of Fig. 1.

Fig. 5 is a cross section view of the epicyclic gears.

Fig. 6 is a perspective view of one of the crankcase halves.

Fig. 7 is a view of one end casing with tracts and clearance holes.

Fig. 8 is a view of the casing-side seal rings, exhaust plate and transfer plate.

Fig. 9 is a view of the cylinder-side seal rings.

Fig. 10 is a view of the inlet and transfer timing rings with the locating bars.

Fig. 11 is a side section view through one of the cylinders and ports of the engine of Fig. 1 illustrating a first position of operation.

Fig. 12 is a view as for Fig. 11 illustrating a second position of operation.

Fig. 13 is a view as for Fig. 11 illustrating a third position of operation.

Fig. 14 is a view as for Fig. 11 illustrating a fourth position of operation.

Fig. 15 is a view as for Fig. 11 illustrating a fifth position of operation.

Fig. 16 is an electrical circuit to control the position of inlet timing ring "A".

Fig. 17 is a view of the control mechanism for inlet timing ring "A"

Fig. 18 is an electrical circuit to control the position of the air vents.

Fig. 19 is a view of the air vent control mechanism.

Fig. 20 is an electrical circuit to control the position of inlet timing ring "B".

Fig. 21 is a view of the control mechanism for inlet timing ring "B".

Fig. 22 is an electrical circuit to control the position of transfer timing ring "A".

Fig. 23 is a view of the control mechanism for transfer timing ring "A".

Fig. 24 is an electrical circuit to control the position of transfer timing ring "B".

Fig. 25 is a view of the control mechanism for transfer timing ring "B".

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will be more readily understood with reference to the following description of an internal combustion engine incorporating the present invention, as illustrated in the accompanying drawings, wherein:-

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Fig. 2 is a cross section view through the engine of Fig. 1.

Fig. 3 is a vertical section view through the engine of Fig. 1.

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Fig. 9 is a view of the cylinder-side seal rings.

Fig.10 is a view of the inlet and transfer timing rings with the locating bars.

Fig.11 is a side section view through one of the cylinders and ports of the engine of Fig. 1 illustrating a first position of operation.

Fig.12 is a view as for Fig. 11 illustrating a second position of operation.

Fig.13 is a view as for Fig. 11 illustrating a third position of operation.

Fig.14 is a view as for Fig. 11 illustrating a fourth position of operation.

Fig.15 is a view as for Fig. 11 illustrating a fifth position of operation.

Fig.16 is an electrical circuit to control the position of one of the timing rings.

Fig.17 is a view of a timing ring control mechanism.

Fig.18 is an electrical circuit the position of the air vents.

Fig.19 is a view of the air vent control mechanism.

outer 48 and air 50 seal ring orifices are all closed.

Fig. 14 illustrates the piston 31 commencing the compression stroke. The transferred gas cannot escape to pollute the exhaust because the transfer plate transfer orifice 65 is not opened until the exhaust plate orifice 70 has closed. The underside of the piston 31 commences the induction stroke.

With particular reference to Fig. 15, at low engine speeds there is enough time for all the transferred gas to enter the outer cylinder 33 before the piston 31 closes the outer port 40. At high engine speeds this critical time is reduced. Thus the pressure release orifices 66A and 66B in the transfer plates 64A and 64B open after the transfer plate transfer orifices 65A and 65B and the outer port 40 have closed. The pressure release tubes 18A and 18B allow any residual fresh charge which may be trapped in the outer port 40 to be returned to the inlet tracts 82A and 82B. Thus the next time the engine 1 is in the exhaust phase no residual fresh charge is left in the outer port 40.

Fig. 16 illustrates an electrical circuit and Fig. 17 illustrates a mechanism for controlling the position of the inlet timing ring 90A. The other inlet timing ring 90B is illustrated in Fig. 20 and Fig. 21. Fig. 22 and Fig. 23 illustrate transfer timing ring 92A. Fig.24 and Fig. 25 illustrate transfer timing ring 92B. The described operation of inlet timing ring 90A is applicable to the other timing rings; only the identification of the parts is different, ie. the A and B sides of the engine, and the Inlet and Transfer components of the engine.

The tachometer needle may be electrically insulated from the driving pin and the point of the needle may make contact with conductive strips associated with the engine speed control points. These points may or may not be evenly spaced, depending upon the power characteristics required from the engine. The other end of the needle may contact an insulated strip connected to a positive potential via an electrical resistance.

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With particular reference to Fig. 15, at low engine speeds there is enough time for all the transferred gas to enter the outer cylinder 33 before the piston 31 closes the outer port 40. At high engine speeds this critical time is reduced. Thus the pressure release orifices 66A and 66B in the transfer plates 64A and 64B open after the transfer plate transfer orifices 65A and 65B and the outer port 40 have closed. The pressure release tubes 18A and 18B allow any residual fresh charge which may be trapped in the outer port 40 to be returned to the inlet tracts 82A and 82B. Thus the next time the engine 1 is in the exhaust phase no residual fresh charge is left in the outer port 40.

Fig. 16 illustrates an electrical circuit and Fig. 17 illustrates a mechanism for controlling the position of the inlet timing ring 90A. The other inlet timing ring 90B is illustrated in Fig. 20 and Fig. 21. Fig. 22 and Fig. 23 illustrate transfer timing ring 92A. Fig.24 and Fig. 25 illustrate transfer timing ring 92B. The described operation of inlet timing ring 90A is applicable to the other timing rings; only the identification of the parts is different, ie. the A and B sides of the engine, and the Inlet and Transfer components of the engine.

The tachometer needle may be electrically insulated from the driving pin and the point of the needle may make contact with conductive strips associated with the engine speed control points. These points may or may not be evenly spaced, depending upon the power characteristics required from the engine. The other end of the needle may contact an insulated strip connected to a positive potential via an electrical resistance.

With reference to Figs. 16 and 17, consider that the engine was turning at 3,500 r.p.m. and is now turning at 5,500 r.p.m. The tachometer needle applies a positive potential to the associated contact 113IA, operating "RW" relay. "RW1" contact prepares the operation of "IRa" relay. "RW2" contact operates the "ILSA" locking solenoid. As the tongue of the "ILSA" locking solenoid is about to clear the groove 109IA in the inlet timing ring control plate 110IA, the "ILSA" contacts operate. "ILSA2" contact operates "IRa" relay via "RW1" being already operated. "ILSA1" contact is associated with "IAa" relay.

"IRa2" contact energizes the retard valves "IRAa" and "IRAb", permitting oil pressure to be applied to one end or the plunger rod 115IA whilst releasing pressure from the other end . Oil, under pressure from the oil pump, enters one control cylinder 114IRa and pushes the plunger rod 115IA against the inlet timing ring control plate 110IA with its attached sprung bearing contact 111IA, causing it to move and remove the negative potential from the contact 113IA on the contact control strip 112IA, releasing "RW" relay. "RW2" contact releases the "ILSA" locking solenoid to rest on the edge of the inlet timing ring control plate 110IA. The "ILSA" contacts remain operated until spring pressure cause the tongue of the "ILSA" locking solenoid to enter the next groove 109IA in the inlet timing ring control plate 110IA when it becomes aligned. This holds the inlet timing ring control plate 110IA rigidly in position and returns the "ILSA" contacts to normal. At this point the contact 113IA on the contact control strip 112IA is positioned so that a negative potential is applied to it via the sprung bearing contact 111IA in the inlet timing ring control plate 110IA. "ILSA2" contact releases "IRa" relay. "IRa2" contact releases the retard valves "IRAa" and "IRAb", removing oil pressure from the plunger rod 115IA.

Increasing engine to 8,000 r.p.m. would repeat a similar action via "RV" relay. Decreasing engine speed back to 3,500 r.p.m. would cause the inlet timing ring control plate

With reference to Figs. 16 and 17, consider that the engine was turning at 3,500 r.p.m. and is now turning at 5,500 r.p.m. The tachometer needle applies a positive potential to the associated contact 113IA, operating "RW" relay. "RW1" contact prepares the operation of "IRa" relay. "RW2" contact operates the "ILSA" locking solenoid. As the tongue of the "ILSA" locking solenoid is about to clear the groove 109IA in the inlet timing ring control plate 110IA, the "ILSA" contacts operate. "ILSA2" contact operates "IRa" relay via "RW1" being already operated. "ILSA1" contact is associated with "IAa" relay.

"IRa2" contact energizes the retard valves "IRAa" and "IRAb", permitting oil pressure to be applied to one end or the plunger rod 115IA whilst releasing pressure from the other end . Oil, under pressure from the oil pump, enters one control cylinder 114IRa and pushes the plunger rod 115IA against the inlet timing ring control plate 110IA with its attached sprung bearing contact 111IA, causing it to move and remove the negative potential from the contact 113IA on the contact control strip 112IA, releasing "RW" relay. "RW2" contact releases the "ILSA" locking solenoid to rest on the edge of the inlet timing ring control plate 110IA. The "ILSA" contacts remain operated until spring pressure cause the tongue of the "ILSA" locking solenoid to enter the next groove 109IA in the inlet timing ring control plate 110IA when it becomes aligned. This holds the inlet timing ring control plate 110IA rigidly in position and returns the "ILSA" contacts to normal. At this point the contact 113IA on the contact control strip 112IA is positioned so that a negative potential is applied to it via the sprung bearing contact 111IA in the inlet timing ring control plate 110IA. "ILSA2" contact releases "IRa" relay. "IRa2" contact releases the retard valves "IRAa" and "IRAb", removing oil pressure from the plunger rod 115IA.

Increasing engine to 8,000 r.p.m. would repeat a similar action via "RV" relay. Decreasing engine speed back to 3,500 r.p.m. would cause the inlet timing ring control plate

110IA to move in the opposite direction via "AW" relay energizing the advance valves "IAAa" and "IAAb". The movement of the inlet timing ring control plate 110IA positions the associated inlet timing ring 90A via the retaining bars 94.

Fig. 18 illustrates an electrical circuit and Fig. 19 illustrates a mechanism for controlling the position of the air vents 106A and 106B. The temperature gauge needle is electrically insulated from the driving pin and its point makes contact with conductive strips associated with the engine temperature control points. The other end of the needle contacts another strip connected to a positive potential via an electrical resistance. These strips are insulated from the temperature gauge body and may or may not be evenly spaced, as also may the grooves 109A in the air vent control plate 110A, depending upon the power characteristics required from the engine 1.

With reference to Figs. 18 and 19, consider that the engine 1 was running at 110 degrees C and is now running at 120 degrees C. The temperature gauge needle applies a positive potential to the associated contact 113A, operating "OW" relay. "OW1" contact prepares the operation of "O" relay. "OW2" contact operates the "ALS" locking solenoid. As the tongue of the "ALS" locking solenoid is about to clear the groove 109A in the air vent control plate 110A, the "ALS" contacts operate. "ALS2"contact operates "O" relay via "OW1" contact being already operated. "ALS1" contact is associated with "C" relay.

"O2" contact energizes the opening valves "OA" and "OB", permitting oil pressure to be applied to one end of the plunger rod 115A whilst releasing pressure from the other end. The oil, under pressure from the oil pump, enters one control cylinder 114O and pushes the plunger rod 115A against the air vent control plate 110A, with its attached sprung bearing contact 111A, causing it to move and remove the negative potential from the contact 113A on the contact control strip 112A, releasing "OW" relay. "OW2" contact releases the

110IA to move in the opposite direction via "AW" relay energizing the advance valves "IAAa" and "IAAb". The movement of the inlet timing ring control plate 110IA positions the associated inlet timing ring 90A via the retaining bars 94.

Fig. 18 illustrates an electrical circuit and Fig. 19 illustrates a mechanism for controlling the position of the air vents 106A and 106B. The temperature gauge needle is electrically insulated from the driving pin and its point makes contact with conductive strips associated with the engine temperature control points. The other end of the needle contacts another strip connected to a positive potential via an electrical resistance. These strips are insulated from the temperature gauge body and may or may not be evenly spaced, as also may the grooves 109A in the air vent control plate 110A, depending upon the power characteristics required from the engine 1.

With reference to Figs. 18 and 19, consider that the engine 1 was running at 110 degrees C and is now running at 120 degrees C. The temperature gauge needle applies a positive potential to the associated contact 113A, operating "OW" relay. "OW1" contact prepares the operation of "O" relay. "OW2" contact operates the "ALS" locking solenoid. As the tongue of the "ALS" locking solenoid is about to clear the groove 109A in the air vent control plate 110A, the "ALS" contacts operate. "ALS2"contact operates "O" relay via "OW1" contact being already operated. "ALS1" contact is associated with "C" relay.

"O2" contact energizes the opening valves "OA" and "OB", permitting oil pressure to be applied to one end of the plunger rod 115A whilst releasing pressure from the other end. The oil, under pressure from the oil pump, enters one control cylinder 114O and pushes the plunger rod 115A against the air vent control plate 110A, with its attached sprung bearing contact 111A, causing it to move and remove the negative potential from the contact 113A on the contact control strip 112A, releasing "OW" relay. "OW2" contact releases the

CLAIMS

1. A two-stroke motor of the rotary piston type including a cylinder block containing a plurality of cylinders, rotatably mounted within an engine housing and indirectly geared to a crankshaft, journalled for a rotation within said engine housing and piston members supported upon said crankshaft for a rotary motion within said cylinder block as said crankshaft and said cylinder block rotate in the same direction; said cylinder block being sealed against said engine housing by slidably mounted circular side seal rings having provision for at least one of an automatically rotatable induction timing ring or an automatically rotatable transfer timing ring and with said engine housing having peripheral pivoted air vents for an automatically variable air flow.

2. The motor of claim 1 wherein said cylinder block is indirectly geared to said crankshaft by epicyclic gears of a ratio of 2:1.

3. The motor of claim 2 wherein said epicyclic gears comprise two "piggy back" idler gears.

4. The motor of claim 3 wherein a timing of the entry of combustion gases into said cylinders is controlled by side entry tracts located in end casings for communication with ports in said cylinders.

5. The motor of claim 4 wherein said ports of said cylinders and said side entry tracts are sealed by an intimate contact between rotating cylinder-side seal rings and stationary casing-side seal rings and exhaust plates.

6. The motor of claim 5 wherein said cylinders are open to atmosphere after combustion via air chokes and reed valves, allowing a fresh cool air to pass across a crown of individual ones of said piston members, thereby purging said cylinders of a residual exhaust gas.

7. The motor of claim 6 wherein the quantity of said cool air is synchronized by said air chokes to be proportional to the quantity of fuel/air mixture consumed by said motor.

CLAIMS

1. A two-stroke motor of the rotary piston type including a cylinder block containing a plurality of cylinders, rotatably mounted within an engine housing and indirectly geared to a crankshaft, journalled for a rotation within said engine housing and piston members supported upon said crankshaft for a rotary motion within said cylinder block as said crankshaft and said cylinder block rotate in the same direction; said cylinder block being sealed against said engine housing by slidably mounted circular side seal rings having provision for at least one of an automatically rotatable induction timing ring or an automatically rotatable transfer timing ring and with said engine housing having peripheral pivoted air vents for an automatically variable air flow.

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5. The motor of claim 4 wherein said ports of said cylinders and said side entry tracts are sealed by an intimate contact between rotating cylinder-side seal rings and stationary casing-side seal rings and exhaust plates.

6. The motor of claim 5 wherein said cylinders are open to atmosphere after combustion via air chokes and reed valves, allowing a fresh cool air to pass across a crown of individual ones of said piston members, thereby purging said cylinders of a residual exhaust gas.

7. The motor of claim 6 wherein the quantity of said cool air is synchronized by said air chokes to be proportional to the quantity of fuel/air mixture consumed by said motor.

CLAIMS

1. A two-stroke motor of the rotary piston type including a cylinder block containing a plurality of cylinders, rotatably mounted within an engine housing and directly geared to a crankshaft, journalled for a rotation within said engine housing and piston members supported upon said crankshaft for a rotary motion within said cylinder block as said crankshaft and said cylinder block rotate in the same direction; said cylinder block being sealed against said engine housing by slidably mounted circular side seal rings having provision for at least one of an automatically rotatable induction timing ring or an automatically rotatable transfer timing ring and with said engine housing having peripheral pivoted air vents for an automatically variable air flow.
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5. The motor of claim 4 wherein said ports of said cylinders and said side entry tracts are sealed by an intimate contact between rotating cylinder-side seal rings and stationary casing-side seal rings and exhaust plates.
6. The motor of claim 5 wherein said cylinders are open to atmosphere after combustion via air chokes and reed valves, allowing a fresh cool air to pass across a crown of individual ones of said piston members, thereby purging said cylinders of a residual exhaust gas.
7. The motor of claim 6 wherein the quantity of said cool air is synchronized by said air chokes to be proportional to the quantity of fuel/air mixture consumed by said motor.

CLAIMS

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6. The motor of claim 5 wherein said cylinders are open to atmosphere after combustion via air chokes and reed valves, allowing a fresh cool air to pass across a crown of individual ones of said piston members, thereby purging said cylinders of a residual exhaust gas.

7. The motor of claim 6 wherein the quantity of said cool air is synchronized by said air chokes to be proportional to the quantity of fuel/air mixture consumed by said motor.

8. The motor of claim 7 wherein at least one of the induction or transfer phases of said motor are automatically varied by rotatable timing rings relative to the speed of said motor.

9. The motor of claim 8 wherein an air vent opening is automatically variable to ensure that the temperature of said motor remains within set limits during operation.

10. The motor of claim 9 wherein a sealing of the casing-side exhaust plate against the cylinder-side outer seal ring is accomplished by the pressure of the exhaust gas.

11. The motor of claim 10 wherein a movement of a big-end of a connecting rod is controlled by rigid guides in the crankcase.

12. The motor of claim 11 wherein individual one of said piston members is cooled internally via air ports in a cylinder wall.

13. The motor of claim 12 wherein a primary compression of an induced gas is increased due to a solid base of said piston members meeting flush with said cylinder block.

14. The motor of claim 13 wherein an unused portion of the fuel/air mixture is returned to an incoming charge.

15. The motor of claim 14 wherein an expansion of said motor upon reaching an operating temperature does not affect a sealing of said motor due to the compressible synthetic rubber "O" ring seals and the slidably mounted seal rings.

8. The motor of claim 7 wherein at least one of the induction or transfer phases of said motor are automatically varied by rotatable timing rings relative to the speed of said motor.

9. The motor of claim 8 wherein an air vent opening is automatically variable to ensure that the temperature of said motor remains within set limits during operation.

10. The motor of claim 9 wherein a sealing of the casing-side exhaust plate against the cylinder-side outer seal ring is accomplished by the pressure of the exhaust gas.

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13. The motor of claim 12 wherein a primary compression of an induced gas is increased due to a solid base of said piston members meeting flush with said cylinder block.

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